CLAIMS

1. A phase distribution measuring apparatus, comprising

a fly-eye lens composed of a plurality of condensing lenses arranged in a matrix on a plane;

an image pickup device which includes a plurality of light receiving elements arranged in a matrix on a light receiving surface, and is arranged so that the light receiving surface becomes parallel to the plane at a distance corresponding to the focal length of the condensing lenses; and

a phase calculating device that calculates a phase distribution of light made incident on the fly-eye lens from data outputted from the image pickup device, wherein

the phase calculating device comprises:

a center position calculation means for calculating bright spot center positions at which the luminance on the light receiving surface becomes maximum based on luminance data detected by each light receiving element; and

a centroid position calculation means for calculating luminance centroid positions in centroid operating regions centered on the bright spot center positions.

2. The phase distribution measuring apparatus

according to Claim 1, wherein

the phase calculating device further comprises a bright spot area calculation means for calculating areas with luminances exceeding a predetermined threshold in predetermined regions centered on the luminance center positions, and

the centroid operating regions are set so as to occupy areas exceeding the areas calculated by the bright spot area calculation means.

3. The phase distribution measuring apparatus according to Claim 1 or 2, wherein the center position calculation means calculates the bright spot center positions based only on data of luminances exceeding a predetermined reference value in the luminance data, and

the centroid position calculation means calculates the centroid positions based only on data of luminances exceeding the reference value in the luminance data.

4. The phase distribution measuring apparatus according to any one of Claims 1 to 3, wherein

the phase calculating device further comprises a smoothing means that converts luminance data corresponding to each of the light receiving elements into a weighted average of the same and luminance data corresponding to adjacent light receiving elements.

5. The phase distribution measuring device according to any one of Claims 1 to 4, wherein

the phase calculating device further comprises a luminance moment calculation means for calculating the moments of luminances in the centroid operating regions,

the center position calculation means and the luminance moment calculation means are formed of a hardware operating circuit, and

the centroid position calculation means calculates the centroid position based on outputs of the hardware operating circuit.

6. A phase distribution measuring method, comprising:

an imaging step in which light is made incident on a fly-eye lens and focal point images of the light are imaged by an image pickup device;

a luminance data calculating step in which a luminance data calculation means is made to calculate luminance data of light detected by light receiving elements of the image pickup device;

a center position calculating step in which a center position calculation means is made to calculate bright spot center positions at which the luminance becomes maximum on the light receiving surface based on the luminance data;

a centroid position calculating step in which a

centroid position calculation means is made to calculate centroid positions of the luminances in centroid operating regions centered on the bright spot center positions; and

5       a phase calculating step in which a phase calculation means is made to calculate the phase of light made incident on the fly-eye lens based on deviation of the centroid position from a predetermined focal position.

10       7. The phase distribution measuring method according to Claim 6, wherein the centroid position calculating step includes a step of calculating a difference between the bright spot center position and the centroid position and a step of calculating the

15       centroid position from the difference.